# 施藥時期及次數之不同對棉金鋼鑽蟲防治效果試驗

陶 家 驊　 眭 國 彥

## 一、前　　言

棉金鋼鑽 (Earias fabia Stoll) 爲本省主要棉鈴害蟲之一，對本省植棉事業之成敗，影響匪淺。筆者等曾於民國42年及43年採用有機磷和氯化烴類殺蟲劑舉行田間防治，成效卓著，每公頃籽棉產量達 2,663～2,956公斤。其中以 0.05% Endrin 乳劑及 0.25% Dieldrin 水懸性粉劑最優，惟因此類殺蟲劑，均賴國外輸入，棉農負擔，尙嫌太重。乃採用上項兩種殺蟲劑在嘉義舉行施藥時期及次數之比較試驗，藉期減輕費用而利大規模推廣，爰將本試驗結果，草爲斯文，謹就正於同道。

## 二、試 驗 方 法

本試驗係於民國44年在省立嘉義高級示範農業職業學校農場舉行，供試驗品種爲 Delfos 關東 119 號，小區面積爲 50m²，5 行每行20株，全區定植共 100 株，行株距 1m×0.5m，於 7 月 4 日播種，曾補種 2 次，方法爲點播，藥劑處理 9 種，並分爲不同施藥時期和次數 3 種，隨機排列，重複 4 次，另設對照區以資比較。施藥 6 次者每14天施藥 1 次，自 8 月 6 日～10月17日；施藥 5 次者每 10天施藥 1 次，自 9 月 5 日～10月15日；施藥 4 次者每 7 天施藥 1 次，自 9 月 5 日～ 9 月26日。每次施藥之稀釋倍數及用量標準，按棉株生育情形而決定。19.5% Endrin 乳劑稀釋 1:780 倍，50% Dieldrin 水懸性粉劑 1:400 倍，25% DDT 乳劑 1:400 倍，施藥 6 次者所需原藥之 Endrin 乳劑 9.46 公升，Dieldrin 水懸性粉劑 17.5 公斤，DDT 乳劑 17.5 公升，5 次者所需 Endrin 乳劑 9.05 公升，Dieldrin 水懸性粉劑 16.75 公斤，DDT 乳劑 16.75 公升，4 次者所需 Endrin 乳劑 7.02 公升，Dieldrin 水懸性粉劑13公斤，DDT 乳劑 13公升。各次施藥稀釋倍數一律，其每次稀釋液一公頃用量標準列表如下：

表 1　每次稀釋液施用量　　(公升/公頃)

Table 1. The amount of applications of insecticidal solution on each time per hectare.

| 施藥次數 No. of applications | 第 1 次 1st | 第 2 次 2nd | 第 3 次 3rd | 第 4 次 4th | 第 5 次 5th | 第 6 次 6th | 合計 Total |
|---|---|---|---|---|---|---|---|
| 6 | 800 | 1,000 | 1,000 | 1,200 | 1,500 | 1,500 | 7,000 |
| 5 | 1,000 | 1,200 | 1,500 | 1,500 | 1,500 | — | 6,700 |
| 4 | 1,000 | 1,200 | 1,500 | 1,500 | — | — | 5,200 |

## 三、試 驗 結 果

（1） 落蕾和落鈴之蟲害率：花蕾及幼鈴之脫落，除氣候和生理 2 項外，蟲害亦爲重要因素之一。今年氣候特殊，落鈴及落蕾時期較往年晚月餘，9 月杪始發現地上落蕾及落鈴。調查工作自 9 月29日起至11月29日止，間隔 7天舉行 1次，先後共9次，每次檢拾各小區地上所有落蕾及落鈴，分盛紙袋中，携回室內分別檢查。經分析結果，得知落蕾及落鈴之差異，在早期及晚期各處理，概

不顯著，惟中期處理之差異，稍為顯著，詳見表 2.

表 2　施藥不同時期與藥劑間對落蕾鈴類和蟲害消長關係之調查　(%)

Table 2. Investigations on the infestations of both shedding squares and bolls between the insecticides and numbers of applications (%)

(A)

| 藥劑 Chemicals | 施藥次數 No. of Applications | 29/IX | 4/X | 11/X | 18/X* | 26/X | 2/X | 10/XI | 17/XI* | 24/XI | 平均 Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Endrin 乳劑 | 6 | 29.17 (25.28) | 59.79 (50.66) | 32.40 (30.74) | 26.78 (30.93) | 21.19 (26.95) | 38.91 (38.20) | 58.88 (50.30) | 79.74 (64.75) | 100.0 (90.00) | 49.65 (45.31) |
| | 5 | 37.50 (33.75) | 30.39 (25.61) | 49.49 (48.09) | 22.40 (28.14) | 35.24 (36.37) | 58.75 (50.42) | 75.77 (61.01) | 85.16 (71.99) | 99.12 (88.24) | 54.92 (49.29) |
| | 4 | 50.00 (45.00) | 37.75 (27.69) | 30.49 (32.71) | 43.60 (41.32) | 48.44 (44.11) | 48.43 (44.08) | 73.14 (62.91) | 96.00 (80.15) | 98.22 (84.59) | 58.01 (51.40) |
| Endrin+DDT 乳劑 | 6 | 0 (0) | 23.81 (21.77) | 16.63 (21.03) | 20.43 (26.77) | 21.64 (27.43) | 24.63 (29.39) | 67.66 (55.92) | 91.70 (75.59) | 97.49 (87.97) | 40.67 (38.43) |
| | 5 | 20.84 (19.72) | 23.74 (24.90) | 5.56 (7.03) | 16.06 (23.03) | 28.09 (30.89) | 41.78 (40.17) | 68.11 (59.73) | 11.29 (75.46) | 95.02 (81.02) | 43.39 (40.22) |
| | 4 | 0 (0) | 0 (0) | 26.35 (26.28) | 37.75 (37.89) | 48.13 (43.94) | 50.08 (45.01) | 68.75 (57.40) | 90.18 (74.76) | 99.59 (88.18) | 46.79 (41.50) |
| Dieldrin+DDT 水懸性粉劑十乳劑 | 6 | 35.42 (28.69) | 38.45 (34.26) | 17.81 (17.94) | 24.82 (29.34) | 15.53 22.90 | 13.89 (18.71) | 40.42 39.22 | 89.32 (77.06) | 100.0 (90.00) | 41.74 (39.79) |
| | 5 | 25.00 (22.50) | 38.35 (37.42) | 30.11 (28.95) | 26.44 (30.91) | 31.77 (34.21) | 49.12 (44.47) | 72.60 (62.36) | 96.62 (82.96) | 99.82 (88.59) | 52.19 (48.01) |
| | 4 | 8.33 (8.87) | 34.17 (35.17) | 47.32 (43.39) | 42.55 (40.73) | 35.61 (36.63) | 54.15 (47.49) | 80.47 (67.13) | 94.28 (78.21) | 100.0 (90.00) | 55.21 (49.72) |
| 對照區 Check | | 29.17 (24.94) | 44.17 (37.69) | 28.33 (28.33) | 46.28 (42.86) | 49.83 (45.04) | 69.86 (57.30) | 46.06 (39.27) | 89.05 (70.91) | 87.50 (78.75) | 54.47 (47.23) |
| 最小差異顯著平準 (L.S.D.) | 5 | 41.14 | 30.08 | 30.77 | 8.65 | 10.08 | 13.51 | 16.50 | 11.61 | 11.46 | |
| | 1 | 55.56 | 40.62 | 41.55 | 11.86 | 13.61 | 18.24 | 22.28 | 15.68 | 15.48 | |

註：括弧內係百分率化為轉角函數，再以分析，測定差異顯著性。
* 係施藥區與對照區之差異顯著性。
(A) 落蕾和蟲害關係之調查。

(B)

| 藥劑 Chemicals | 施藥次數 No. of Applications | 29/IX | 4/X | 11/X | 18/X* | 26/X* | 2/XI* | 10/XI* | 17/XI | 24/XI | 平均 Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Endrin 乳劑 | 6 | 33.33 (31.31) | 23.82 (21.22) | 8.52 (14.46) | 5.16 (13.12) | 9.42 (17.28) | 13.56 (20.78) | 32.48 (34.66) | 59.61 (50.75) | 77.65 (61.79) | 29.26 (29.49) |
| | 5 | 0 (0) | 3.57 (5.56) | 12.05 (20.02) | 6.60 (14.78) | 19.32 (25.43) | 13.83 (21.74) | 35.34 (36.22) | 76.19 (61.50) | 88.52 (70.59) | 28.38 (28.43) |
| | 4 | 0 (0) | 0 (0) | 27.26 (31.23) | 14.87 (22.61) | 24.86 (29.13) | 17.27 (24.35) | 33.18 (34.71) | 68.29 (56.62) | 85.39 (67.67) | 30.12 (29.59) |
| Endrin+DDT 乳劑 | 6 | 0 (0) | 12.56 (17.34) | 10.53 (15.90) | 7.65 (14.98) | 8.20 (16.33) | 6.85 (15.50) | 34.84 (35.72) | 69.00 (55.36) | 79.36 (64.02) | 25.44 (26.24) |
| | 5 | 0 (0) | 3.85 (5.78) | 12.90 (19.35) | 7.26 (15.21) | 11.51 (19.66) | 12.28 (20.21) | 34.91 (36.15) | 66.14 (56.07) | 83.92 (66.61) | 25.86 (25.56) |
| | 4 | 0 (0) | 0 (0) | 14.68 (19.23) | 9.74 (17.80) | 17.49 (24.41) | 13.97 (21.91) | 39.97 (39.12) | 74.85 (62.42) | 83.06 (66.09) | 28.19 (27.89) |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dieldrin＋DDT<br>水懸性粉劑＋乳劑 | 6 | 0<br>(0) | 13.02<br>15.24 | 17.45<br>(23.53) | 6.91<br>(15.06) | 8.24<br>(16.01) | 5.23<br>(13.15) | 27.87<br>(31.29) | 60.40<br>(51.46) | 82.13<br>(65.75) | 24.03<br>(25.72) |
| | 5 | 0<br>(0) | 0<br>(0) | 3.41<br>(9.00) | 3.46<br>(10.70) | 14.73<br>(21.74) | 11.01<br>(19.02) | 35.86<br>(36.56) | 68.40<br>(56.64) | 83.06<br>(67.03) | 26.44<br>(24.52) |
| | 4 | 25.00<br>(22.50) | 0<br>(0) | 22.02<br>(27.15) | 16.48<br>(23.64) | 21.67<br>(27.48) | 14.53<br>(22.40) | 38.65<br>(37.61) | 75.73<br>(61.60) | 89.36<br>(72.35) | 33.71<br>(32.75) |
| 對照區<br>Check | | 12.50<br>(11.25) | 12.78<br>(18.15) | 20.19<br>(26.12) | 20.49<br>(26.59) | 19.56<br>(25.46) | 18.33<br>(25.17) | 30.00<br>(32.85) | 48.80<br>(43.94) | 70.52<br>(58.95) | 28.13<br>(29.83) |
| 最小差異顯著平準<br>(L.S.D.) | 5 | 24.96 | 22.08 | 14.40 | 5.19 | 9.36 | 5.26 | 8.57 | 10.47 | 9.57 | |
| | 1 | 33.70 | 29.82 | 19.44 | 7.01 | 12.65 | 7.10 | 11.57 | 14.14 | 12.92 | |

註：括弧內係百分率化爲轉角函數再以分析，測定差異顯著性。

* 施藥次數與對照區之差異顯著性。

(B) 落鈴和蟲害關係之調查。

(2) 棉鈴之蟲害率：棉株生長期中，可能遭金剛鑽蟲4～5個世代蹂躪，初則出土後3～4星期之幼苗梢被害，繼則花蕾，幼鈴及鮮鈴。惟因此蟲之密度係屬累積性，愈至晚期，爲害愈烈，調查工作在44年10月4日至45月1月5日間，每隔2星期舉行2次；先後共7次，每次每小區調查20株。據統計結果，在9月、10及11月(上旬)，鮮鈴被害率祇2.33～16.56迨至11月下旬驟增達24.98～47.50％；可見此蟲之本年猖獗時期，較往年延遲月餘，似因9.10月間氣溫突然降下所致。各處理中棉鈴被害率之差異除10月4～6日及12月6～8日兩次外，均不顯著詳見表3.

表3 施藥不同時期與藥劑間對棉金鋼鑽蟲爲害時期之調查 (％)

Table 3. Investigations on the infestations of bolls between the insecticides and numbers of applications (%)

| 藥劑<br>Chemicals | 施藥次數<br>No. of Applications | 4-6/X* | 22-24/X | 4-8/XI | 25-28/XI | 6-8/XII* | 22-24/XII | 5/I | 合計<br>Total | 平均<br>Average |
|---|---|---|---|---|---|---|---|---|---|---|
| Endrin<br>乳劑 | 6 | 4.07<br>(11.13) | 2.84<br>(9.45) | 2.38<br>(7.45) | 28.98<br>(31.88) | 33.69<br>(35.47) | 41.78<br>(40.25) | 68.70<br>(59.95) | 182.44<br>(195.58) | 26.06<br>(27.94) |
| | 5 | 1.68<br>(5.96) | 1.02<br>(5.50) | 4.20<br>(10.81) | 37.84<br>(37.67) | 40.38<br>(39.33) | 49.41<br>(44.52) | 60.92<br>(56.80) | 195.45<br>(200.59) | 27.92<br>(28.66) |
| | 4 | 0.12<br>(0.99) | 3.94<br>(11.42) | 3.77<br>(10.77) | 39.47<br>(38.85) | 35.51<br>(36.58) | 55.69<br>(47.14) | 60.79<br>(50.28) | 199.29<br>(196.03) | 28.47<br>(28.00) |
| Endrin＋DDT<br>乳劑 | 6 | 0.63<br>(3.62) | 2.50<br>(8.77) | 2.64<br>(7.93) | 34.23<br>(33.30) | 31.32<br>(34.00) | 44.66<br>(41.86) | 57.66<br>(49.70) | 173.64<br>(179.18) | 24.81<br>(25.60) |
| | 5 | 1.93<br>(6.80) | 2.15<br>(7.95) | 4.13<br>(10.26) | 32.28<br>(34.55) | 35.83<br>(36.61) | 41.92<br>(43.32) | 66.73<br>(60.20) | 185.97<br>(199.69) | 26.42<br>(28.53) |
| | 4 | 1.77<br>(5.12) | 1.59<br>(6.34) | 6.02<br>(13.05) | 39.17<br>(38.44) | 34.95<br>(36.01) | 50.53<br>(45.34) | 65.43<br>(54.53) | 209.46<br>(198.83) | 29.92<br>(28.40) |
| Dieldrin＋DDT<br>水懸性粉劑＋乳劑 | 6 | 0.77<br>(4.22) | 0.98<br>(3.72) | 2.44<br>(7.14) | 24.98<br>(29.93) | 29.72<br>(32.88) | 45.03<br>(39.51) | 58.05<br>(50.99) | 161.96<br>(168.39) | 23.14<br>(24.06) |
| | 5 | 0.35<br>(2.38) | 2.46<br>(6.00) | 6.13<br>(11.19) | 42.57<br>(40.68) | 34.13<br>(35.54) | 50.66<br>(45.34) | 26.12<br>(26.45) | 162.42<br>(167.58) | 23.20<br>(23.94) |
| | 4 | 0.74<br>(2.52) | 2.33<br>(8.67) | 1.75<br>(7.18) | 35.81<br>(36.59) | 37.80<br>(37.78) | 52.30<br>(46.32) | 79.03<br>(66.68) | 209.76<br>(205.74) | 29.97<br>(29.39) |
| 對照區<br>Check | | 4.31<br>(11.71) | 3.34<br>(9.06) | 16.56<br>21.09 | 44.75<br>(41.92) | 52.98<br>(46.92) | 62.55<br>(52.25) | 62.96<br>(52.89) | 247.46<br>(235.84) | 35.35<br>(33.69) |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 最小差異顯著平準 | 5 | 3.80 | 5.66 | 11.09 | 9.01 | 6.98 | 7.60 | 28.87 | | |
| (L.S.D.) | 1 | 5.13 | 7.65 | 14.98 | 12.17 | 9.43 | 10.26 | 38.96 | | |

註：括弧內係百分率化爲轉角函數，再以分析，測定差異顯著性。
* 施藥區與對照區之差異顯著。

（3） 每株結鈴數：45年1月5日調查各小區20株上所有鈴數，經分析結果，施藥次數間及藥劑種類間之差異，均屬不顯著，但與對照區之差異，概屬顯著。內以 Endrin 乳劑及 Dieldrin 水懸性粉劑＋DDT 乳劑，施藥6次之兩區爲數最多，平均每株結鈴 31.56～31.25 枚，對照區僅15.00枚。參閱表 4.

（4） 棉鈴吐絮率：通常棉鈴被害後，蛀孔極易發生紅腐病，可使整個棉鈴因先行腐敗而不能吐絮，惟今年氣候特殊，被蛀之棉鈴，鮮有罹紅腐病者，吐絮率竟達 92.91～97.89％；據45年1月5日調查結果，施藥區與對照區間棉鈴吐絮率之差異，均不顯著，參閱表 4.

（5） 籽棉產量：施藥區與對照區間籽棉產量之差異，均屬顯著，且施藥次數間之差異亦屬顯著，各施藥劑處理區之產量指數爲 225.26～289.03。詳見表 4.

表 4　施藥不同時期與藥劑間防治棉金鋼鑽蟲試驗成果

Table 4. Effectiveness of both the insecticides and numbers of applications against spiny bollworm.

| 藥　　劑 Chemicals | 施藥次數 No. of applications | 每株結鈴數平均 No of bolls per plant (AV) | 棉鈴吐絮率(％) Percentage of dehiscent bolls | 每公頃籽棉產量 (kg) Yield of seed cotton kg/ha. | 指　數 Index |
|---|---|---|---|---|---|
| Endrin 乳　劑 | 6 | 31.29 | 97.23 | 2,792.00 | 289.03 |
| | 5 | 29.00 | 96.41 | 2,760.00 | 244.31 |
| | 4 | 28.80 | 95.22 | 2,294.00 | 238.51 |
| Endrin＋DDT 乳　劑 | 6 | 29.35 | 96.96 | 2,520.00 | 260.58 |
| | 5 | 29.15 | 96.18 | 2,329.00 | 240.58 |
| | 4 | 28.89 | 92.91 | 2,274.00 | 235.40 |
| Dieldrin＋DDT 水懸性粉劑＋乳劑 | 6 | 31.56 | 97.01 | 2,656.00 | 274.95 |
| | 5 | 31.28 | 96.92 | 2,624.00 | 271.62 |
| | 4 | 27.31 | 96.12 | 2,176.00 | 225.26 |
| 對照區 Check | | 15.00 | 96.98 | 966.00 | 100.00 |
| 最小差異顯著平準 (L.S.D.) | 5 | 4.91 | 5.08 | 409.40 | |
| | 1 | 6.63 | 6.87 | 560.80 | |

## 四、結論和提要

本試驗於民國44年在嘉義農校農場擧行，供試驗殺蟲劑爲 Endrin 乳劑，Dieldrin 水懸性粉劑和 DDT 乳劑三種，藥劑處理卽 Endrin, Endrin＋DDT, Dieldrin＋DDT，並分施藥 6, 5, 4 次者處理共九個，另設對照區 3 個，以資比較，藥劑防治棉金剛鑽所受影響之事項如次。

（1） 落蕾和落鈴之蟲害率：施藥區與對照區間之差異，前後兩期不顯著，中期較顯著，但施藥次數間之差異不顯著。

（2） 棉鈴之蟲害率：施藥區與對照區間之差異，早中兩期較顯著，晚期則不顯著，愈至後期

受害率愈高，施藥區之棉鈴受害率平均為 23.20～29.97 %，對照區平均為 35.35%。

（3） 每株棉鈴數：施藥區與對照區之差異，均極顯著，惟施藥之次數間概不顯著，施藥區每株結鈴數平均為 27.31～31.55 枚。對照區15枚幾成 2 與 1 之比。

（4） 棉鈴吐絮率：今年因受氣候特殊，紅腐病鮮有發生，吐絮率竟達 92.91～97.78 %，故施藥區與對照區之差異，概不顯著。

（5） 籽棉產量：施藥區與對照區之產量差異，均屬顯著，惟施藥區間之差異除 4 次外，均不顯著，施藥區每公頃折合籽棉產量達 2176.00～2792.00 公斤，其中以施藥 6 次及 5 次者兩區間最高，其產量指數為 244.31～289.03，施藥 4 次區之產量指數為 225.26～238.516。Endrin 和 Endrin 混合 DDT，Dieldrin 混合 DDT 乳劑各處理間之產量差異，概不顯著，似並無加用必要。

誌謝：本試驗工作進行期中承楊所長致福督促鼓勵，農復會劉博士廷蔚惠贈殺蟲劑和蒞臨指導，又承劉蒼麟、湯慶銓、余健敏、王連春、廖西湖、郭昆津諸君協助及分析，文成後，復蒙馬駿超先生詳為校閱，均此附致謝忱。

## 參 考 文 獻

（1） 陶家驊：(1953)臺灣幾種棉作害蟲防治法 臺灣農林月刊 7(12):32—35。
（2） 陶家驊、沈羽川、湯慶銓：(1956)棉花害蟲田間藥劑防治初步試驗報告 中華農學會會報新 (15):75—77

# APPLICATION'S SCHEDULES FOR THE CONTROL OF SPINY BOLLWORM (*EARIAS FABIA* STOLL) IN TAIWAN IN 1955

by

CHIA-HWA TAO and KWA-YANN SUI

## SUMMARY

19.5% endrin emulsion, 50% dieldrin wettable powder and 25% DDT emulsion were tested for control of the spiny bollworm. The tests were carried out at the Chia-non farm in Taiwan. It was divided into four blocks of 12 plots each, nine difference treatments were used, including 0.025% endrin, 0.025% endrin combined with 0.0625% DDT and 0.125% dieldrin wettable powder combined with 0.0625% DDT and three checks (untreated plots) were assigned at ramdon to each blocks. Each insecticdes was applied with three different numbers of applications, namely four times, five times. or six times. The rate of applications was 7.03 liters of 19.5% endrin, 13 kgs of 50% dieldrin and 13 liters of 25% DDT at four times; 9.05% liters of 19.5% endrin, 16.75 kgs of 50% dieldrin, and 16.75 liters of 25% DDT at five times; and 9.46 liters of 19.5% endrin, 17.5% kgs of 50% dieldrin, and 17.5 liters of 25% DDT at six times per hectare. The results of these tests were summarized as follows:

1. Percentage of infestation of shedding squares and shedding bolls in the early party of the season and later in the season showed no significant difference

between the different insecticides used and the check. But in mid-season there was a significant difference between the different treatments and the check.

2. Percentage of infested bolls in early-season and mid-season except late-season was significantly higher different than between the different treatments and the check. Infestation of bolls receiving treatments averaged 23.20% to 29.97% as compared with 35.35 in the check. During late-season infestation of the spiny bollworm in all treatments was increased.
3. The number of bolls on each plant receiving treatments was higher than in the check, but there was no significant difference between the number of bolls on plants depending on the number of applications of the insecticides. The treated plant had 27.31 to 31.55 bolls per plant as compared with 15 bolls in the check, which is about double that of the control.
4. Percentage of dehiscent bolls did not show significant difference between the different treatments and the check, because the fungi (Fusarioum sp. and Diplodia gossypina Cooks) did not gain entrance through the penetrations in the boll wall made by the spiny bollworm. They did not develop because of unfavorable weather condition. It was 92.91% to 97.78% in all plots.
5. Yield of seed cotton receiving treatments was significantly higher than the check. It was 2,176 to 2,792 kgs of seed cotton per hectare as compared with 966 kgs in the check. There was no a significant difference between plots receiving five or six applications, those receiving five or six applications but there was significant as compared with those receiving four applications. In the five or six applications the index of yield (above check) was 244.31 to 289.03; and in the four applications the index of yield was 225.26 to 238.51.
6. It was found that the insecticides were about equal in effectiveness against this pest. Endrin alone or and combined with DDT, or dieldrin combined with DDT gave about the same resutls in the experiments.